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NOVEMBER 25, 1985

CHEMICAL & ENGINEERING

NEWS

ETHYLENE IN EUROPE

Rationalization continues despite opening of new facility in Scotland

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CHEMICAL & ENGINEERING
NEWS

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NOVEMBER 25, 1985

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CHEMICAL STOCKS: Performance outstrips Dow Jones

Although the Dow Jones Industrials Average lately has been getting great press as it consistently hits record highs, chemical stocks also have been rising strongly. In fact, since the first of the year, C&EN's chemical stock index has outperformed the Dow Jones and all other major market indicators, often by wide margins.

C&EN's stock index has increased 31% to 278 from 212 in the first week in January. This in spite of flat production and prices and declining earnings in general for the chemical industry. By contrast, since the first of the year, the Dow Jones Industrials Average has increased 12% to 1435.09; the New York Stock Exchange composite, 17% to 114.36; the New York Stock Exchange Industrials 15% to 130.94; the American Stock Exchange Index, 4% to 237.76; the Over-the-Counter Composite, 6.4% to 306.17; Standard & Poor's 500, 17% to 198.11; and Standard & Poor's 400 Industrials, 15% to 220.06. The Over-the-Counter Industrials have fallen almost 9% to 307.51.

However, chemical stocks enjoyed much of their increase earlier in the year. Since the first part of October, when the Dow Jones began its run, chemicals and the broader average have pretty much kept pace, each rising about 8%.

A number of reasons account for the early rise of chemical stocks. One is simply that Union Carbide stock was so depressed after the Bhopal tragedy that it kept the C&EN index low through the first part of the year. As this stock began to recover toward more normal levels, it brought the index back to where it should be. Carbide's stock price is some 60% higher than it was at the beginning of the year. However, that has been offset some recently by a softening in Monsanto's stock price, caused by its exposure to potential liabilities from its G. D. Searle subsidiary's Copper-7 intrauterine contraceptive device.

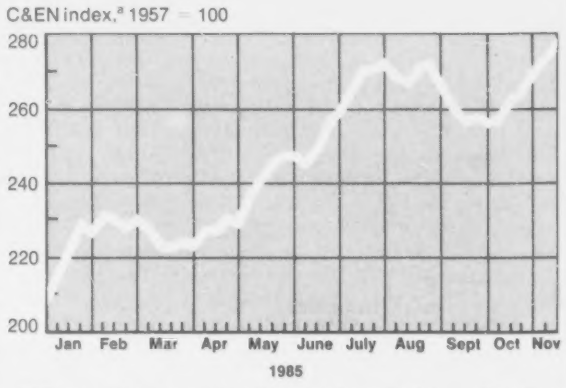
Another reason has been the bullishness on chemical stocks by Wall Street security analysts. One of the earliest of the analysts to get behind chemicals was Peter Butler of Paine Webber, who based his opinion on earnings improvement brought on by restructuring in many chemical companies—a restructuring that has been proceeding since before midyear. More recently, Butler sees positive implications of these restructurings in 1986 if prices firm. Margins, he says, will benefit from lower break-even points and from lower oil-related raw material and energy costs.

Since early October, the chemical stock average has followed the Dow Jones. However, there is a great variation among stock performance in the chemicals group. American Cyanamid and Union Carbide lead the list with 14% stock price rises since early October, followed closely by Dow Chemical with a 12% price increase. The rest of the companies, however, have performed below the average. Celanese's stock is up 5% and W. R. Grace and Hercules' stock each have risen 2%. Monsanto's stock has fallen almost 2% during the period. □

Chemicals have done better than major indexes this year

	Nov. 15, 1985	Jan. 4, 1985	% change
Dow Jones Industrials Average	1435.09	1286.64	11.5%
New York Stock Exchange Composite	114.36	97.71	17.0
New York Stock Exchange Industrials	130.94	113.97	14.9
American Stock Exchange Index	237.76	227.73	4.4
Over-the-Counter Composite	306.17	287.90	6.4
Over-the-Counter Industrials	307.51	336.16	−8.5
Standard & Poor's 500	198.11	169.28	17.0
Standard & Poor's 400 Industrials	220.06	190.64	15.4
C&EN Chemical Stock Index	278	212	31.1

Chemical stocks gain 31% since beginning of 1985



a C&EN weighted stock price index of American Cyanamid, Celanese, Dow Chemical, W. R. Grace, Hercules, Monsanto, and Union Carbide.

Demand for Fiber Intermediates Continues To Slow

Producers forecast imports of apparel to further reduce consumption of major intermediates DMT/PTA, ethylene oxide, cyclohexane

Bruce F. Greek, C&EN Houston

As 1985 draws to a close, producers of large-volume materials that go into synthetic fibers that eventually become apparel and home furnishing are assessing their business outlook for next year. In their forecasts, further small declines in demand are looming. Demand for dimethyl terephthalate (DMT) and purified terephthalic acid (PTA) could be an exception, but demand for both cyclohexane and ethylene oxide very likely will decline.

The general slowing of demand for these fiber materials results from a shift from a domestic to a global economy during the past 10 years. Foreign manufacturers of end products (apparel) produce at lower cost than do U.S. makers. Buyers, therefore, more and more snub U.S. products. For a while, this development didn't bother the fiber materials producers, because they made up sales lost to textile fiber makers and sellers through increased exports. But exports have, or are expected to, become weaker because foreign producers of fiber materials have the advantage of lower raw material costs.

Key Chemicals

This situation results in much reduced profitability from operations for producers of the fiber intermediates DMT/PTA, ethylene oxide, and cyclohexane. Consequently, producers follow a usual practice of shutdowns, especially for old, relatively inefficient, and depreciated plants.

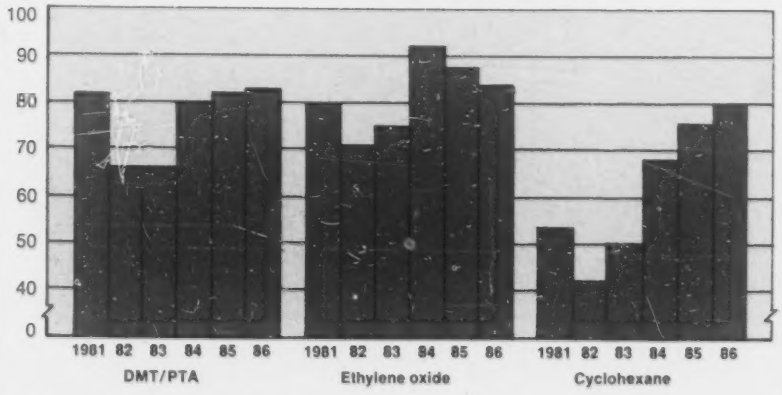
One result of such plant shutdowns is a high operating rate of at least 80% for the remaining plants. Such rates don't always produce high profitability, but at least they improve it. Another possible result: shortages of capacity if demand were to pick up rapidly. Shortages of these fiber materials, however, would be spotty or temporary because of their growing availability worldwide.

In view of the global economy, producers of these and other major-volume organic chemicals will be looking for lowest-cost sources of raw materials, and such sources now are located outside the U.S. As producers shift to foreign sources, plant locations change. This particularly is the case for ethylene oxide, the one product of the three major fiber intermediate materials with the least dependence on fibers. Capacity to make ethylene oxide in the U.S. began to decline when two producers brought on stream plants in western Canada where the raw material, ethylene, costs less because of the lower cost of natural gas. Ethylene glycol, the ethylene oxide derivative used in polyester fibers, now moves with rising volumes in international commerce from various sources.

New limits that might be imposed on imports of apparel in 1986 could delay declines in demand for fiber materials. Forecasts previously have been based on the current rates of increase in imported apparel. However, most industry observers expect that beyond actual bans on imports, the cost differentials are enough to keep interested parties working to find ways around any new limits that will be imposed. Hence, they believe that further declines are in store for U.S. production of fiber intermediates.

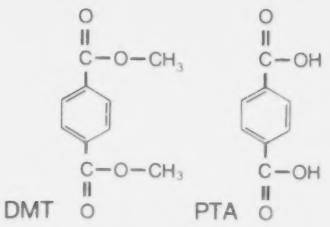
For some details of the near-term outlook for the major-volume fiber intermediates, please see the following pages.

Capacity utilization improved because of plant shutdowns



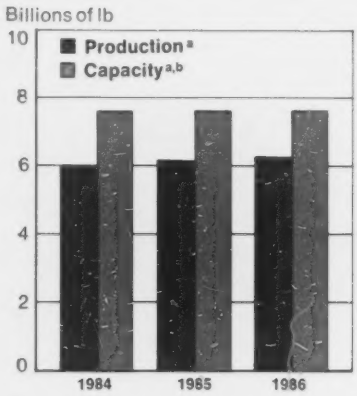
Note: Capacities as of beginning of year and assumed constant during year.
Sources: U.S. International Trade Commission, C&EN estimates

DMT/PTA



- ***Demand better***
- ***Capacity holding***
- ***Prices level***

PRODUCTION/CAPACITY



a DMT and DMT equivalents of PTA (1.0 lb of PTA = 1.17 lb of DMT). b First quarter.

MAJOR PRODUCERS

Amoco Chemical, Cape Industries, Du Pont, Eastman Chemical

HOW MADE

Oxidation of p-xylene to make PTA; oxidation of p-xylene and concurrent esterification with methanol to make DMT

MAJOR DERIVATIVES

Poly (ethylene terephthalate) 90%, poly (butylene terephthalate) 5%

MAJOR END USES

Polyester fibers 70%, films 10%, bottles 10%

FOREIGN TRADE

Exports—rising rapidly, may hit 1 billion lb of DMT and DMT equivalents; imports—negligible

PRICES

About 35 cents per lb for DMT; 39 cents per lb for PTA

Of the major-volume fiber materials, only dimethyl terephthalate (DMT) and purified terephthalic acid (PTA) have shown any strength in 1985. The upbeat performance of these two materials derives from a rapid rise in exports of PTA and from continued strong growth in demand for the polyester resins, mainly poly (ethylene terephthalate) (PET), used for making bottles and films.

Next year, demand for DMT and PTA likely will continue to grow, but at a reduced pace as exports grow more slowly because polyester apparel makers will not be helped by efforts to limit textile apparel imports. Demand for polyester bottle resins will continue to increase. Other small uses of these materials, such as poly (butylene terephthalate) (PBT), also will require more DMT and PTA.

Estimates of DMT and PTA production, traditionally fuzzy, made by the U.S. International Trade Commission have been sharpened during recent years, according to various industry sources who say that the problem of overreporting production through possible double counting has been minimized. As a result of this improvement, sources reckon the preliminary estimate for 1984 production of DMT and PTA (equated to DMT) of 6 billion lb could be close to actual production.

Based on that figure, 1985 output of DMT and PTA may be up more than 3% to about 6.2 billion lb. However, if exports turn out to have been unusually large in some months of this year's second half, as they were in the first half, then production could exceed 6.3 billion lb this year. Next year, exports likely will level off, partly in anticipation of more stringent limits on synthetic apparel imports and partly because other countries will increase their competition with U.S. exports. If that happens, the production gain for DMT and PTA could fall to the 1 to 2% range.

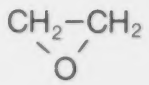
Plants making these two polyester intermediates have had no capacity expansions recently, and none are anticipated in 1986. Based on 1985 production of 6.2 billion lb, with nameplate capacity totaling 7.6 billion lb, the average operating rate this year is nearly 82%.

Most DMT and PTA become polyesters, PET, PBT, or some other terephthalate. Roughly two thirds of polyesters become fibers. However, the share consumed as fibers has been dropping as demand for bottle and film resins has grown much more rapidly. (Fiber demand could decline 1 to 2% in 1985.) Besides bottles and film, the miscellaneous uses of polyesters include a host of specialty resins for a variety of small-volume applications.

Polyester fibers are produced largely as filament and staple. The filament has some industrial uses (such as tire cord), but demand has slowed. The apparel uses of filament rise and fall to some degree with fashion and with imports. Demand for staple fibers, generally used in blends with cotton and wool, is influenced by such factors as price of the natural fibers, which can influence the composition of blends because polyester has a relatively stable price and is affected by apparel imports.

Film uses of polyester resins have been surpassed by bottle uses. End uses of films, especially in the various magnetic tape consumer products, are growing well by historical levels, but they are just not up to the growth in bottles. The growth in film uses, including the nontape areas such as packaging, could be in the 5 to 7% range next year.

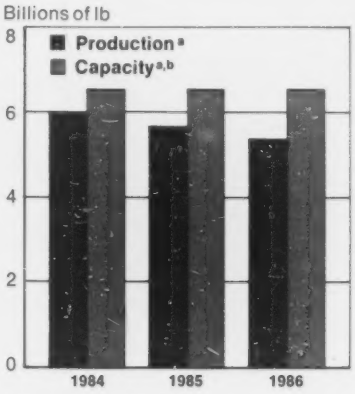
Growth in demand for bottle resins has surprised many industry sources. Improvements both in molding methods to give greater speed in production of bottles and in applications are part of the reason for this growth. Another reason is the appreciation that grocers have developed for the handling ease of returned polyester bottles. The growth in bottle resins could be 7 to 10% in 1986.



Ethylene Oxide

- ***Production lower***
- ***Capacity may fall***
- ***Prices down***

PRODUCTION/CAPACITY



a First quarter. b Excludes plants with capacity of more than 900 million lb announced as on standby.

MAJOR PRODUCERS

BASF Wyandotte, ICI Americas, Shell Chemical, Texaco Chemical, Union Carbide

HOW MADE

Vapor-phase oxidation of ethylene with air or oxygen

MAJOR DERIVATIVES

Ethylene glycol 60%, ethoxylates 10%, glycol ethers 5%, ethanolamines 5%

MAJOR END USES

Polyester fibers, films, and molded items 30%, antifreeze 25%, surfactants 10%, solvents 5%

FOREIGN TRADE

Exports—small, about 50 million lb; imports—small, about 25 million lb

PRICE

About 35 cents per lb for merchant sales

Although the ethylene oxide market is not dominated by synthetic fibers, polyesters and other textile uses of ethylene oxide's major derivatives—ethylene and diethylene glycols—still take about a third of production. These derivatives also face the inroads of imported apparel. Except for polyester bottle resins, other uses of ethylene glycols as well as other ethylene oxide derivatives either are growing slowly or are declining.

As a result, demand for ethylene oxide has been slowing this year and is expected to decline further in 1986. Despite some reports that ethylene glycol antifreeze supply has tightened this fall, industry sources forecast ethylene oxide production in 1985 will decline about 5% to 5.7 billion lb. A similar decline has been forecast for 1986 production, bringing production next year to less than 5.5 billion lb. Those declines will follow a gain of more than 400 million lb in 1984 over 1983 production and will put 1986 production below that of 1983.

Pressure is on ethylene oxide prices as a result of declining demand and falling ethylene tabs, even though a relatively small share of output actually is marketed. Likewise, declining demand for ethylene oxide derivatives, especially ethylene glycol, puts pressure on their prices. Consequently, plants have been left shut down for long periods.

Because of current business conditions and expanding worldwide capacity to make ethylene oxide/glycol, restarting of the plants put on standby seems unlikely. Some 900 million lb of nameplate capacity to make ethylene oxide therefore has been removed from the capacity list. Currently operating capacity totals about 6.5 billion lb in the U.S. Purposely expanding this capacity now seems to be unlikely with lower-cost ethylene oxide products available from Canada. For the next few years, ethylene oxide capacity either will remain steady or decline.

If 1985 production totals 5.7 billion lb, then the operating plants will be run at about 88% of nameplate capacity. That's a relatively high rate of operation for organic chemical plants. However, the plant operating rate in 1986 will decline again, with the average at about 83%.

Consumption of ethylene oxide will continue to be dominated by conversion to the glycol, which in turn goes to two major uses: polyester fibers and antifreeze. More than 60% of ethylene oxide goes to glycol, and about 90% of the glycol goes to those two uses. Other uses of ethylene glycol include solvents, deicing fluids, and as an intermediate in making other derivatives. None of the small uses will grow fast enough to affect production of ethylene oxide.

About half of ethylene glycol is consumed in polyesters. By far the largest use is in fibers, now being hurt by apparel imports. If polyester resins used in making various kinds of bottles were not growing so well, the decline in the polyester use of ethylene oxide would be greater. Film uses are smaller than bottle uses, but they are helping significantly to keep up demand.

Some 40 to 45% of ethylene glycol goes into antifreeze. At one time, an important part of the glycol for antifreeze came from impure by-product of polyester manufacture. Now, most of the by-product glycol is cleaned up on site and recycled.

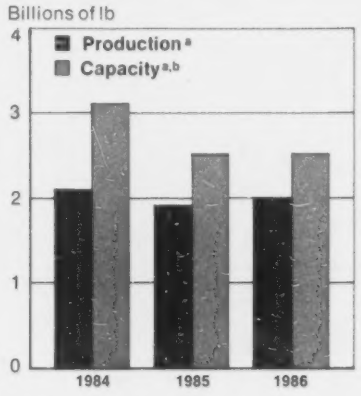
The antifreeze business generally has been trending toward lower volume because of a growing number of cars and trucks on the road with smaller engines. Longer term, the antifreeze business as an outlet for ethylene oxide will be one of little, if any, growth.

The other third of ethylene oxide consumption is made up of many small uses. Some of these, such as glycol ethers, ethoxylates (largely surfactants), and ethanolamines, are large. But none of these have end uses that are growing fast enough to affect demand for ethylene oxide significantly.

Cyclohexane

- ***Production nearly level***
- ***Capacity holding***
- ***Prices lower***

PRODUCTION/CAPACITY



a First quarter. b Excludes capacity shut down and not expected to restart.

MAJOR PRODUCERS

Du Pont, Chevron Chemical, Phillips Chemical, Texaco Chemical, Unocal

HOW MADE

Catalytic hydrogenation of benzene; recovery from natural gasoline

MAJOR DERIVATIVES

Adipic acid 60%, caprolactam 30%

MAJOR END USES

Nylon 66 60%, nylon 6 30%

FOREIGN TRADE

Exports—rising to about 250 million lb; imports—small, less than 10 million lb

PRICE

About $1.20 per gal

Producers of cyclohexane almost certainly will post a decline in U.S. sales this year. However, exports of this intermediate, which eventually becomes nylon apparel and carpet, will rise. But the increase in exports won't be enough to reduce pressure on prices—pressure that is heightened by declining prices for benzene, which along with hydrogen is the basic raw material for cyclohexane.

This year's cyclohexane production will fall below 2 billion lb and probably will be less than 1.9 billion lb. That would represent a 10% decline from the 1984 preliminary estimate of 2.13 billion lb made by the U.S. International Trade Commission. Further, it's likely that for the next several years output will remain well below the historical high of 2.4 billion lb set in 1979.

The 1986 prospects for cyclohexane production are not much brighter. Synthetic fiber producers will have the same problems. For example, those who use cyclohexane to make nylon will be looking for ways to negate the effects of imported apparel. Even with moderate success of textile makers in reducing apparel imports, total cyclohexane production likely will rise only modestly, perhaps 5%, because of reasonably strong carpet demand.

With that sort of lackluster forecast, producers will continue to contend with severe price competition. Old formulas for estimating selling prices as a function of benzene prices have changed. Temporary voluntary allowances have been granted on the cost spread between benzene and cyclohexane.

Some producers have shut down cyclohexane units for long periods amid industry rumors that those units would not be restarted. Because the plants have been down so long now, their capacity has been removed from C&EN's estimates, reducing the estimate of the industry's nameplate capacity nearly 1 billion lb to about 2.5 billion lb. By discounting this idled capacity, a relatively good operating rate appears for the remaining capacity. If, for example, 1.9 billion lb of cyclohexane is produced in 1985 from 2.5 billion lb of capacity, then the average operating rate becomes 76% of nameplate capacity, a rate acceptable but not necessarily good by today's standards for making large-volume organic chemicals. In addition, this rate is low enough that it will keep pressure on prices without much relief in 1986.

The use pattern for cyclohexane is not expected to change anytime soon. More than 80% of cyclohexane is used to make nylon that eventually becomes some apparel or home furnishings product. Engineering resins account for most of the other uses of nylons. Cyclohexane also is used as a solvent and in making derivatives of cyclohexanol and cyclohexanone, which are used in making dyes, pesticides, and other specialties.

Nearly two thirds of cyclohexane consumed in the U.S. goes to make adipic acid. The adipic acid and hexamethylene diamine derived from other raw materials are used to manufacture nylon 66. Most of this nylon goes to apparel, which is affected by the pressure that imports put on sales and prices of domestically produced apparel. Because of low profitability in making apparel nylon, at least one producer, Monsanto, has announced plans for a gradual withdrawal from its position as a supplier. Because of that, demand for cyclohexane to make nylon 66 will weaken during 1986.

Slightly less than one third of cyclohexane consumption goes into nylon 6. But phenol is a competitor of cyclohexane in making caprolactam, the precursor of nylon 6. A large part of nylon 6 goes into carpet fibers, which are much less affected by imports than are apparel fibers. Relatively low labor costs are involved in making carpet, reducing the advantages of cheap labor outside the U.S. and keeping imports minimal. The strength in the carpet market will account for most of the net growth in demand for cyclohexane in 1986.

Further Shakeout Expected in Europe's Ethylene Industry

Despite a temporary price increase caused by a series of disasters, capacity will have to be reduced to regain healthy sales and profit margins

Patricia L. Layman, C&EN London

New ethylene plant at Mossmorran, Scotland, began production in October

In late October the first ethylene from the 1.10 billion lb-per-year plant at Mossmorran, Scotland, was sent to Grangemouth, where it entered the U.K. pipeline system.

For the Scots, opening the plant at Mossmorran, at Cowdenbeath, across the Firth of Forth from Edinburgh, was a major event. Construction of the plant, which cost roughly $580 million, was begun in October 1981. Contractor Lummus Crest brought it in below budget and ahead of schedule.

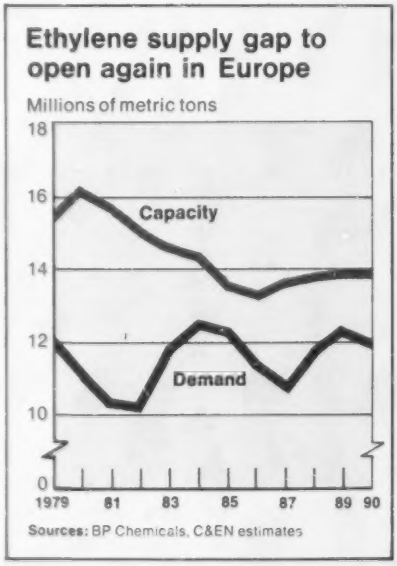
It is Europe's most modern ethylene plant, boasts Essochem, a U.K. unit of Exxon, and joint owner with Shell Chemicals U.K. of the Mossmorran unit. It is also—probably—the last major ethylene plant that will be built in Western Europe for a long time. In the European ethylene business during the past two years, there has been one distinct trend—the industry must reduce capacity to regain any semblance of healthy sales and profit margins.

"Producers are beginning to grasp the nettle," and cut back ethylene production, observes Stuart Wamsley, a partner and director of W. Greenwell & Co., securities analysts in London. "Their troubles aren't over yet, but the willingness is there."

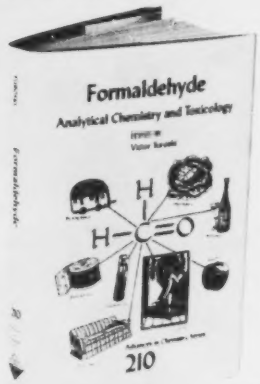
Even more than in the U.S., overcapacity has been a chronic problem for the European ethylene business, something that has been painful to adjust to. This summer the situation improved temporarily, but for the unhappiest of reasons: various disasters, including explosions and equipment collapse.

The major outage was Enichem's 1.32 billion lb-per-year cracker at Priolo, Sicily, which suffered a fire and explosion. Despite strong rumors in Italy that Enichem would use the outage as a reason to close the plant and thereby trim employment, the company has let reconstruction contracts, and indications are that the cracker will begin operating again early next year. Similarly, the 827 million lb-per-year cracker at Stenungsund, Sweden, owned by Statoil, the Norwegian national oil company, is back in operation following the repair of collapsed equipment. And the 772 million lb-per-year cracker owned by DSM at South Limburg, the Netherlands, which was knocked out by fire in August, has begun operating after repair.

However, industry observers believe it is unlikely that the 441 million lb-per-year capacity of Rheinische Olefinwerke, jointly owned by BASF and Shell, will be rebuilt, after an explosion this summer. Similarly, the capacity of the Texaco plant at Raunheim, West Germany, has been trimmed by 154 million lb to 550 million lb, and the plant is



Formaldehyde
Analytical Chemistry and Toxicology



NEW!

Victor Turoski, *Editor*
James River Corporation

Ends the dispute over the controversial chemical, formaldehyde. Airs differing opinions on its toxicity, concluding that used at "normal levels" CH_2O is not a human carcinogen. Provides valuable current knowledge on the analysis of formaldehyde at trace levels, on its toxicity, and on the risk assessment of the relative safety of this small organic chemical.

CONTENTS

Industrial Hygiene Sampling and Analytical Methods • Ion Chromatography with Pulsed Amperometric Detection • Analysis of Formaldehyde in Industrial Labs • Method Development for Determining Trace Levels in Polluted Waters • Quantitative Analysis of Condensates in Vapor State • Evolution of Testing Methodology for Atmospheric Formaldehyde in Home Environment • Predicting Release of Formaldehyde from Cellulosic Textiles • Release from Pressed Wood Products • Current Status of Measurement Techniques and Concentrations in Residences • Emission from Combustion Sources and Solid Formaldehyde-Resin-Containing Products • Field Evaluations of Sampling and Analytical Methods • Measurements in Canadian Homes Using Passive Dosimeters • Generation of Standard Gaseous Formaldehyde in Test Atmospheres • Toxicology • History and Status in Cosmetics Industry • FDA's Perspective • Exposure to Formaldehyde • Review of Epidemiologic Evidence Regarding Cancer and Exposure • Formaldehyde in Dialysis Patients • Formaldehyde and Cancer • Estimating Human Cancer Risk • Evaluation of Potential Carcinogenic Hazard • Formaldehyde Risk Analysis • Refining the Risk Assessment

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expected to be closed completely by the end of this year. Enichem already has closed a total of 970 million lb of capacity at various crackers.

This summer, however, the supply/demand situation was blissful to long-suffering ethylene producers. Prices firmed, with tabs on the minuscule spot market rising to about 25 cents from 20 cents a lb ($1.00 = 3.0 deutsche marks). Before the accidents, it had been assumed that second-quarter contract prices would be about 22 cents per lb, but they generally were about 22.5 cents.

During the third quarter, the firming became evident and contract prices were in the range of 23 to 24 cents. But spot prices were 19.2 to 19.5 cents, and now that fourth-quarter contracts are being signed, indications are that the average price will be down two cents from third-quarter contract prices.

There certainly were capacity constraints on the market in the first six months of this year, notes John Wyatt, manager of petrochemical services at Parpinelli Tecnon, consultants in Milan. Nevertheless, ethylene output was increasing. "If you extrapolate from the first eight months, you'll find that ethylene production was higher this year than in 1984. So production is there, and the markets are softening."

Overall demand is down, adds Wyatt, because of a declining demand for downstream products. More than half of ethylene in Europe, about 54%, is used for polyethylenes, 18% for ethylene dichloride, and 11% for ethylene oxide, points out Eric V. Edwards, business manager for olefins and gases at BP Chemicals. "Buyers are squeezing the margins now," he says, just as producers squeezed as much as they could earlier, when capacity was tight. Moreover, buyers are squeezing the margins at the same time European producers are watching their feedstock costs being affected by currency exchange rates. During the past two quarters, ethylene prices fell 13%, but because of exchange-rate vagaries, costs for naphtha, which feeds more than 80% of European crackers, fell only 10%.

"Margins are going to continue being squeezed," Edwards adds,

Major West European producers of ethylene line up this way

	Capacity (thousands of metric tons per year)		Capacity (thousands of metric tons per year)
Dow Chemical	1,325	Petrochim	525
Shell	1,240[a,b]	URB	440
Enichem	1,080	Bayer/BP	440
Essochem	1,060[a]	Statoil	375
BP Chemicals	830[c]	Montedison	365
DSM	800	Noretyl	350
Atochem	720[c]	GNP	300
BASF	675[b]	OeMV	275
CdF Chimie	660[d]	Caltex	250
BP/ICI	650	Neste	185
EMP	600	Others	810
Veba	600	TOTAL	14,555

a Includes 50% of 500,000 metric-ton-per-year capacity from newly on-stream Mossmorran, Scotland, plant. b Includes 50% of 450,000 metric-ton-per-year capacity of Rheinische Olefinwerke (nameplate capacity 650,000 metric tons). c Includes 50% of 500,000 metric-ton-per-year capacity of Naphtachimie. d Includes 60% share (250,00 metric tons per year) from joint venture with Qatar. Sources: SRI International, W. Greenwell & Co.

"until overcapacity is fundamentally over. That can happen in two ways: We can pray for increased demand, which is unlikely in the next couple of years, or we can hope another cracker will shut down."

It is probably just a matter of time until that happens. Indeed, once it became clear that Mossmorran production was imminent, Essochem Europe announced that it would close its plant at Cologne, West Germany, by the end of the year. That eliminates annual capacity of 990 million lb per year. And Shell first threatened, then officially confirmed, closure of its 309 million lb-per-year cracker at its Carrington plant, near Manchester, England. Shell in particular has been heavily criticized for the action by the U.K. press, which focused on the net loss of jobs, a touchy subject in England and elsewhere in Europe. Manpower at Carrington is being cut from a peak of 3000 to 500.

It could probably be argued that, had Shell and Esso known what they know now about the conditions the industry faces today, they would never have built the Mossmorran plant. However, given the plant's access to North Sea gas fields and ethane feedstock, powerful political and economic arguments favored the plant. Ethane crackers are cheaper to operate than those fed by naphtha, although it is difficult to get any estimate—even rough estimates—of how much cheaper. U.K. sources, in particular, are loath to comment on a topic over which Imperial Chemical Industries is suing the U.K. government.

According to John A. Collins, managing director of Shell Chemicals U.K., "Although, in isolation, the economics of ethane vs. naphtha were unarguable, the decision was not at all an easy one" to build Mossmorran. "A lot of hard thought and heart-searching went into the question: Could we really justify the huge investment when it would certainly make other naphtha-based ethylene production redundant?" What swung the argument, he indicates, was that Middle East producers, as well as producers in the U.S. and Canada, are using ethane as a cheaper source of ethylene than the naphtha or gas oil Europe depends on.

Despite serious concern in the past several years about the potential impact of ethylene from Saudi Arabia and Qatar, industry sources indicate that it has had little impact on the ethylene industry in Europe.

Says analyst Wamsley, "The Saudis are spreading their marketing around the world. Any impact has been of European making—the Europeans were frightened and began cutting prices too quickly, ahead of the game."

What the Saudis are doing, however, is cutting into the export markets that have become increasingly important to European producers. Wamsley points out that there are about 50 countries around the world producing petrochemicals that were not producing them five years ago. He reckons that if new and announced cracker capacity is built, those countries will add capacity of 44 billion lb per year by 1990.

As expected, the Mideast contributes a sizable chunk of that—roughly 6.1 billion lb. East bloc countries account for another 8.9 billion lb projected capacity. And Far Eastern countries, primarily China, have plans to add 17.1 billion lb. □

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